

PORTABLE PERSONAL SERVER DEVICE
WITH BIOLOGICAL INFORMATION RECOGNITION DEVICE

FIELD OF THE INVENTION

The present invention pertains to a portable personal server device that has a biological information recognition device with a server function so it can perform processing such as exchanging data, etc. with a network to which it is connected by a communication terminal's network connection means, by communicating with a communication terminal that has a network connection means.

BACKGROUND OF THE INVENTION

The information that is necessary for business and daily life is stored as electronic data in the internal storage device of a personal computer (PC), a server system connected to a network, or in an external memory device connected to a PC, etc. PCs are widely and generally used for accessing this data and processing data.

In recent years, the spread of the Internet has made it possible to access needed data via a network from PCs located anywhere. Therefore, when data becomes needed, a user can connect to a network utilizing a nearby PC and access the needed data. As a result, it commonly occurs that a single user uses two or three PCs: a PC located in the office, a portable PC used when out of the office on a business trip, etc., a PC located in the home, etc. Meanwhile, it is also the case that a PC located in an office or home is shared by a plurality of users.

Also, the need to have access to information at all times has increased, so data is also being copied to information processing terminals such as PDAs and portable telephones and constantly carried around. Storage devices such as USB tokens, media cards, etc. are used as means for simply making data constantly portable.

The unrestricted copying of data to PCs and information processing terminals is directly connected to information leaking. Therefore, terminal access control technology using passwords or biological information is used as a means for identifying the right of access to data.

One proposal for a PC with this sort of terminal access control technology is a minicomputer with a fingerprint authentication card inserted in a PC slot; it is then used as one's own PC. (For example, see Patent Document 1.) Another proposal is a PDA with a built-in a fingerprint sensor, thus providing individual recognition and security functions. (For example, see Patent Document 2.)

Patent Document 1: Japanese Laid-open Patent Application 272349/1999

Patent Document 2: U.S. Patent No. 6016476

DISCLOSURE OF THE INVENTION
PROBLEMS THE INVENTION IS TO SOLVE

When a single user utilizes multiple PCs to access data via a network, it frequently occurs that the accessed data is distributed to and stored in multiple PCs. Also, if the user processes the data, the data before processing and the data after processing are distributed on different PCs and saved there, and information consistency cannot be maintained.

Therefore, if data is unitarily collected and stored or processed on a server connected to a network, the consistency of information can be maintained with relative ease. In this case, users themselves cannot easily manage a server, so a server managed by someone else is relied upon for the relevant server abilities and administration, and data is temporarily put there with payment of something of value.

However, it is an uneasy feeling to be physically separated from personal data that only the user should access, and to entrust it to a server that is not under one's own control. It is also costly. Also, a server connected to a network is usually shared by many users. Therefore, regardless of what safety measures are taken, inevitably there is a high risk of information leaking to another person who can access the server. Also, when accessing the network is not possible, the relevant server cannot be accessed and it is impossible to obtain the needed data when it is needed.

Also, when multiple users share a PC, users store data on the same physical memory device, so there is a high risk of information leaking to other users sharing the PC.

When data is carried around on an information processing terminal the operability of the information processing terminal is generally worse than that of a PC, and compatibility too is low, so usually a PC is used as the main terminal and the information processing terminal is used as an auxiliary terminal. As a result, the user is bothered by having to convert data formats between the PC that is the main terminal and the information processing terminal and having to maintain data consistency and so forth.

When data is carried around on a portable memory medium such as a storage device, a network-connected server or other network device cannot communicate directly with the storage device. Therefore the user must do the bothersome operation of moving data stored in the storage device to a PC temporarily, and then sending the data from the PC to the network. As a result, if a copy of the data remains in the PC, there is a risk of information leaking.

On the other hand, if a PC is used as one's own PC by means of an authentication device, the authentication device is used to simply pass authentication information to the PC and start a specified service on the PC. Also, the services supplied from these authentication devices are usually fixed, and they bear a dedicated CPU, so they can be updated. However, in this case too only a very limited service description area of only a few 100 Kbytes or so can be provided. Also, currently these have to be programmed using a manufacturer-specific API, so the services provided by these authentication devices are essentially limited to the services provided by the manufacturer, and expandability is meager.

Next, when a company's confidential data, etc. is exchanged between the company and employees, the company's system administrator can manage the movement and processing of data within the company's own network according to the relevant administrator's policies. However, once data has moved outside the company's own network, it is difficult to thoroughly enforce management policies. For example, it is difficult to apply in-house management policies to information that an employee accesses and obtains using a PC located at home; the company must rely on the employee's common sense.

The issue addressed by the present invention is, in light of these points, to provide a portable personal server device with a server function capable of processing data between it and a network connected using a communication terminal's network connection means; it does so by communicating with a communication terminal that has a network connection means in order to unitarily manage data.

MEANS FOR SOLVING THE PROBLEMS

In order to solve these problems, the portable personal server device of the present invention comprises:

A local server means for processing data between itself and a communication terminal that has a network connection means;

A network server means for processing data between itself and a network connected to the communication terminal by the communication terminal's network connection function;

An individual authentication means for authenticating an individual based on biological information; and

A control means that makes the local server means and the network server means useable only when authenticated by the individual authentication means.

The portable personal server device of the present invention has a local server means that processes data between itself and a communication terminal equipped with a network connection means. That is, it functions as a local server by communicating with a communication terminal (such as a PC, etc.) equipped with a network connection means, so it is possible to access data stored in the portable personal server device using a PC installed at any location. In addition, even if data is processed by a PC, the processed data is always stored on the portable personal server device and the data can be updated to the latest data. As a result, data is not distributed across multiple PCs and data consistency is maintained. Also, it is not necessary to pay attention to the format of the data. Also, data is not distributed across multiple PCs, so it is possible to manage data according to a company's management policies by thoroughly enforcing management of the portable personal server device.

Also, the portable personal server device of the present invention has a network server means for processing data between itself and a network connected to the communication terminal. Therefore it is possible to send information from the portable personal server device to the network, to receive data from the network, to perform automatic processing, and to return the processing result to the indicated communication terminal device. Also, the portable personal server device is connected to the network via the communication terminal, but the portable personal server device itself has a network server function, so data is not saved in the communication terminal, even temporarily. Therefore there is absolutely no leakage of information from data saved in the communication terminal.

In addition, the inventive portable personal server device has an individual authentication means that authenticates an individual based on biological information such as a fingerprint, etc., and a control means that makes the local server means and the network server means useable only when authenticated by the individual authentication means. Therefore data stored in the portable personal server device cannot be accessed by someone other than its owner. Therefore, even if the portable personal server device is lost, leakage of data to another person can be avoided. In particular, it is possible to constitute a portable personal server device so it does not have all of the operational input/output devices (devices such as a keyboard, display, etc.). If this is done, even if the portable personal server device is lost, it is difficult for another person to access the internal data, and confidentiality is high.

Also, after the owner of the portable personal server device is identified by the individual authentication means, the portable personal server device is caused to function as a network server by a network authentication means that utilizes a special digital certificate, etc. As a result, another person who tries to access a portable personal server device that is functioning as a network server from the network can confirm that the relevant portable personal server device is

not the wrong one and the portable personal server device is the owner's. Also, [the other person using the network] can confirm that the actual owner of the relevant portable personal server device is using it, so it is possible to reduce the risk of accessing a network server operated by a malicious person. In addition, in the event that a problem occurs while accessing a portable personal server device, it is possible to determine that the cause of the problem was caused by the relevant portable personal server device and its owner, so the reliability of the communication system can be ensured.

Here, the individual authentication means is equipped with a biological information recognition device such as a fingerprint sensor, etc., and can be constituted so that it authenticates an individual according to whether or not biological information read by the biological information recognition device matches registered biological information that was previously registered.

Also, the portable personal server device of the present invention preferably has a data encryption means for encrypting stored data using the read biological information. Data stored in the portable personal server device is encrypted based on the owner's biological information, so even if someone disassembles the portable personal server device and attempts to access the data within, it is difficult for another person to decode the stored data, and leakage of data to another person can be avoided.

In addition, the portable personal server device of the present invention preferably has a communication encryption means so that when the read biological information matches the registered biological information, it generates and retains a key used in a public key encryption system based on the read biological information, and encrypts the data to be sent using the key. The communication encryption means protects data that is being sent and received via a network, so the security of the communication system is ensured.

In addition, the portable personal server device of the present invention preferably has a communication cable terminal for connection to the communication terminal; it can receive power from the communication terminal via this communication cable terminal. Power is supplied from the side of the communication terminal, which is a PC or the like, so the portable personal server device does not need to have its own power source. As a result, the portable personal server device is small and can be manufactured cheaply, so it is convenient for individual users to carry around constantly. Nor does it need to be charged. In addition, the portable personal server device and the communication terminal become able to communicate by connecting a physical means, so the risk of interception of communication between the portable personal server device and the communication terminal is low.

In this case, a USB connection terminal is preferred as the communication cable terminal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a block diagram showing the structure of one example of a communication system structured using the portable personal server device of the present invention.

FIGURE 2 is a block diagram showing the structure of the portable personal server device of FIGURE 1.

FIGURE 3 is an external oblique view of the portable personal server device of FIGURE 1.

FIGURE 4 is a conceptual diagram representing the software structure of the portable personal server device of FIGURE 1.

EXPLANATION OF CODES

1	Portable personal server device
2	PC
3	External server
10	Communication system
11	Network
12	External network
20	Relay service
21	CPU
22	Fingerprint authentication device
23	Communication interface
23a	Connection terminal
24	Memory
25	Storage media card slot
26	Flash ROM
27	Fingerprint sensor portion
28	USB cable
31	Device body
41	Operating system
42	Fingerprint authentication program
43	Server program
44	Encryption program

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT OVERALL STRUCTURE

FIGURE 1 is a block diagram showing the structure of one example of a communication system employing the present invention. As shown in FIGURE 1, this embodiment's communication system 10 comprises a portable personal server device 1 and a PC 2 that has a network connection means. The portable personal server device 1 and PC 2 are connected by a network 11 so that they can communicate. The PC 2 is connected to an external network 12 such as the Internet, etc. The network 11 and external network 12 are both IEEE802 networks with TCP/IP connection. An external server 3 is connected to the external network 12.

CONSTITUTION OF PORTABLE PERSONAL SERVER DEVICE

FIGURE 2 is a block diagram showing the structure of the portable personal server device. The portable personal server device 1 comprises a CPU 21, a fingerprint authentication device 22, a communication interface 23, a memory (RAM) 24, a storage media card slot 25, and a flash ROM 26. Stored in the flash ROM 26 are an operating system (OS) 41, a fingerprint authentication program 42, a server program 43, and an encryption program 44.

FIGURE 3 is an external oblique view of the portable personal server device. The portable personal server device 1 comprises a device body 31 with an egg-shaped contour shape whose size is as large as the palm of a hand. A fingerprint sensor portion 27 of the fingerprint authentication device 22 is disposed in the center of the surface of the device body 31. The communication interface 23's connection terminal 23a is disposed at the end of the device body 31. The communication interface 23 is a USB communication interface; connected to the connection terminal 23a is a USB cable 28 connected to the network 11.

Here, the communication interface 23 supplies the function of allowing the personal server device 1 and PC 2 to communicate via the network 11, and the function of allowing the personal server device 1 to communicate with the external network 12 via the PC 2. Also, the fingerprint authentication device 22 and fingerprint authentication program 42 provide the individual authentication means. That is, the fingerprint authentication device 22 reads the user's fingerprint information detected by the fingerprint sensor portion 27, and the fingerprint authentication program 42 compares the read fingerprint information to the previously registered fingerprint information. If the fingerprint information matches, this authenticates that the user is the previously registered user and the real person.

The server program 43 provides the local server function of processing data between itself and the PC 2, and the network server function of processing data between itself and the external network 12. The encryption program 44 provides a data encryption means that encrypts data stored in the personal server device 1 based on fingerprint information.

FIGURE 4 is a conceptual diagram representing the software structure of the personal server device. The hardware constitutes, from the bottom layer, the OS, database, data provider interface, framework, service provider interface, service, and messaging API.

CONNECTION BETWEEN PORTABLE PERSONAL SERVER DEVICE AND COMMUNICATION TERMINAL

The portable personal server device 1 receives power from the PC side and starts when it is connected to the PC 2 by the communication interface 23. The user touches a fingertip to the fingerprint sensor portion 27 of the fingerprint authentication device 22, and receives individual authentication using fingerprint information. If the read fingerprint information obtained by the fingerprint authentication device 22 matches the registered fingerprint information previously registered in the personal server device 1, the portable personal server device 1 becomes able to communicate with the PC 2 via the network 11.

The portable personal server device 1 and PC 2 obtain an address using APIPA in order to be able to communicate via the network 11. When doing so, addressing is performed cooperatively in order to avoid conflict with the address of the external network 12 connected to the PC 2. After addressing, the PC 2 finds the personal server device 1 by performing discovery using a relay service 20 installed in a WindowsTM PC. A protocol called SOAP (Simple Object Access Protocol) that includes discovery is used in communication between the portable personal server device and PC 2. It uses XML syntax.

When the PC discovers the portable personal server device 1, the external network 12 and the portable personal server device 1 become able to communicate. In addition, the portable personal server device 1 also connects to the external network 12 using a special digital certificate. If a connection is established between the external network 12 and portable personal server device 1 as a result of this operation, the portable personal server device 1 functions as a network server on the external network 12. Using a network authentication means, another person or an external server 3 that is attempting to access the portable personal server device 1, which is functioning as a network server, can confirm from the external network 12 that the portable personal server device 1 is not the wrong one and that the portable personal server device 1 is the previously registered user's.

Here, the PC 2's relay service 20 relays SOAP messages from an application on the PC 2 to the portable personal server device 1, from the portable personal server device 1 to an application on the PC2, from the portable personal server device 1 to the external server 3, etc.

Also, the portable personal server device 1 generates and retains the key used in the public key encryption system based on the fingerprint information obtained by the fingerprint authentication device 22. Also, when necessary it generates a shared key and provides a communication encryption function that uses both the shared key and public key.

OPERATING EFFECT

A user who carries around the portable personal server device 1 can always store data and applications in the portable personal server device 1. Therefore data can be unitarily managed, and a specific application can be used from multiple PCs without being installed at the PC itself.

Also, the portable personal server device 1 has an individual authentication means that uses fingerprint information, so someone other than the registered owner cannot connect to the PC 2 and operate it as a local server or network server. In addition, the portable personal server device 1 does not have an intrinsic input/output device, so it is difficult for someone other than the actual owner to access the stored data and there is no risk of information leaking. Also, another person who is attempting to access the portable personal server device 1, which is functioning as a network server, from the external network 12 can determine that the relevant portable personal server device 1 is not the wrong one and the portable personal server device 1 is the previously registered user's, so reliability of the communication system 10 is high.

In addition, the portable personal server device 1 is connected to the PC 2 and the external network 12 in the communication system 10 by TCP/IP and functions as a local server and network server. Therefore it is possible to provide a user interface that can be interactive using an ordinary Internet browser. Also, data and messages can be passed to the external server 3 connected to the external network 12, and a program at the external server 3 can be directly utilized.

In addition, the connection between the portable personal server device 1 and the external network 12 uses the relay service 20 installed in the PC 2, so data is not retained in the PC 2, even temporarily. Therefore there is no risk of information leaking from the PC 2.

Next, the portable personal server device 1, unlike the typical device or storage device for authentication, has a hardware constitution like that of the typical server hardware, consisting of a CPU 21, flash ROM 26, RAM 24, etc. Therefore it can employ the same constitution as a standard application server as an internal software constitution. It also has a dedicated CPU 21, so it is possible to construct a communication system that provides services within the portable personal server device 1, processes external calculation requests, and automatically outputs the calculation processing result without placing a load on the PC 2.

Also, when providing services within the portable personal server device 1, it is possible to provide them as an API based on the standard Web Services specification defined in W3C, for example, and to not use a specialized API, so service developers do not need to learn a new programming language, and it is easy to develop an application that uses the services provided by the portable personal server device 1 or to expand the functions of the service itself, etc.

In addition, the portable personal server device 1 has a dedicated database corresponding to XML/SOAP, so it can be used as an ordinary data communication system. Also, the compatibility of developed applications is high. Also, the portable personal server device 1 is provided with a storage media card slot 25, so if necessary it is possible to supply a storage space of theoretically unlimited size by switching media cards. In this case too the encryption program 44 encrypts the stored data in the media card based on fingerprint information, so data confidentiality is high.

In addition, USB is used as the communication interface 23 connecting the portable personal server device 1 and the PC 2, so power can be supplied to the portable personal server device 1 from the PC 2. Therefore it does not need its own power source and the device can be miniaturized. Also, recharging, etc. is not necessary, which is convenient for portability.

ANOTHER EMBODIMENT

Furthermore, the portable personal server device 1 that was described above used USB for connection with the PC 2. The physical connection with the PC may be wireless or wired; for example, Ethernet, Bluetooth, WLAN, infrared, etc. can be utilized. In any case, all of the data is encrypted using SSL communication, etc., so the security of communication can be ensured.

INDUSTRIAL APPLICABILITY

According to the present invention, a user can carry around a portable personal server device, so data and applications can always be managed unitarily. Also, it functions as a local server and network server by communicating with a communication terminal equipped with a network communication means such as a PC, etc., so data and applications stored in the portable personal server device can be accessed using a PC installed at any location. In addition, it is equipped with an individual authentication means that uses biological information such as a fingerprint sensor, etc., so someone other than the owner cannot make the portable personal server device function as a server device. Therefore, even if the portable personal server device is lost, another person cannot access its stored data, so data leaking can be avoided. Also, another person attempting to access the portable personal server device from the network can know that the portable personal server device that is functioning as a network server always belongs to the actual owner, so communication reliability can be ensured.

Therefore, if the inventive portable personal server device is used, it is possible to construct a communication system with high reliability when utilizing network applications, etc. that use distributed network servers.